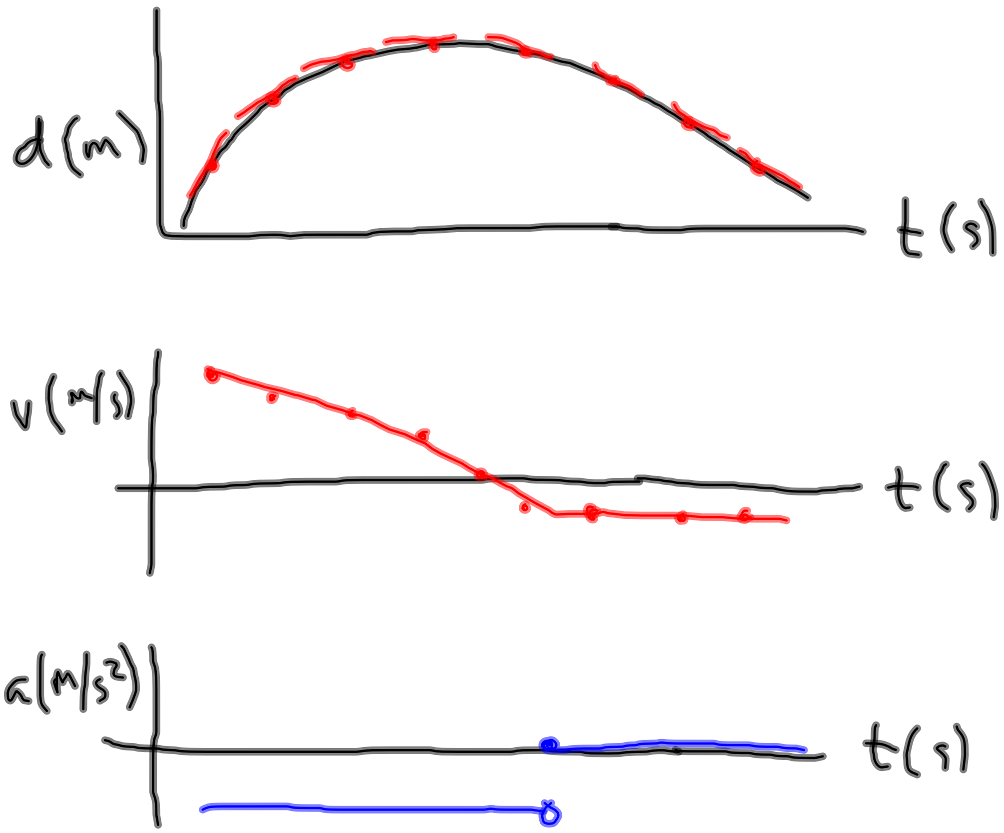
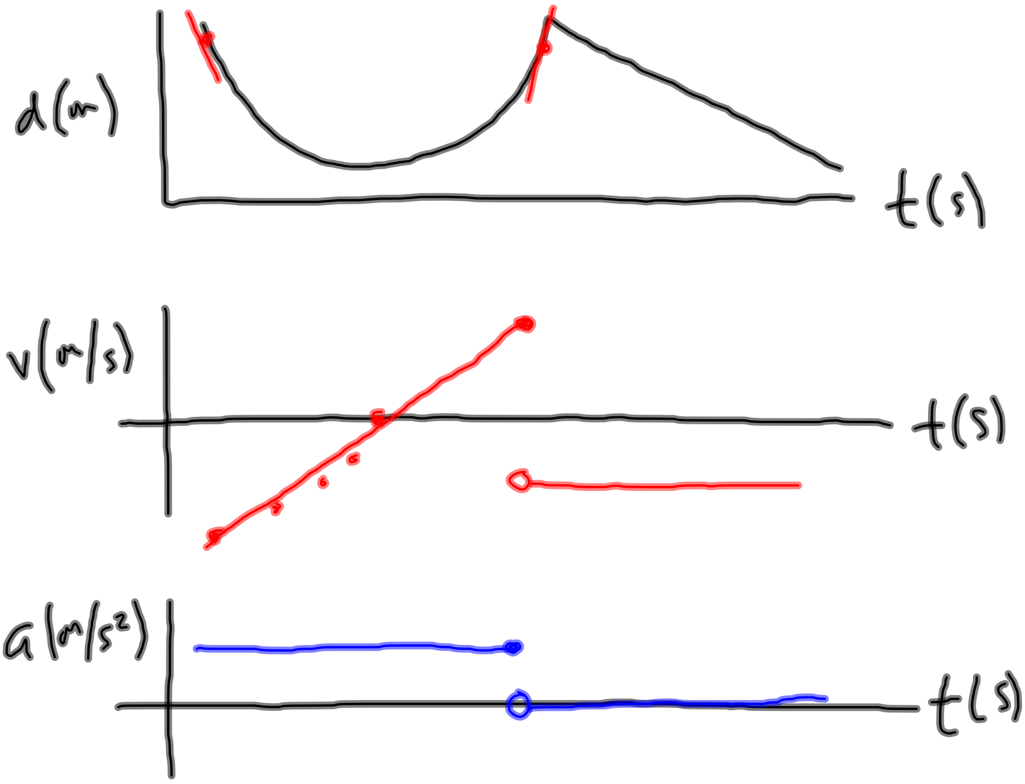
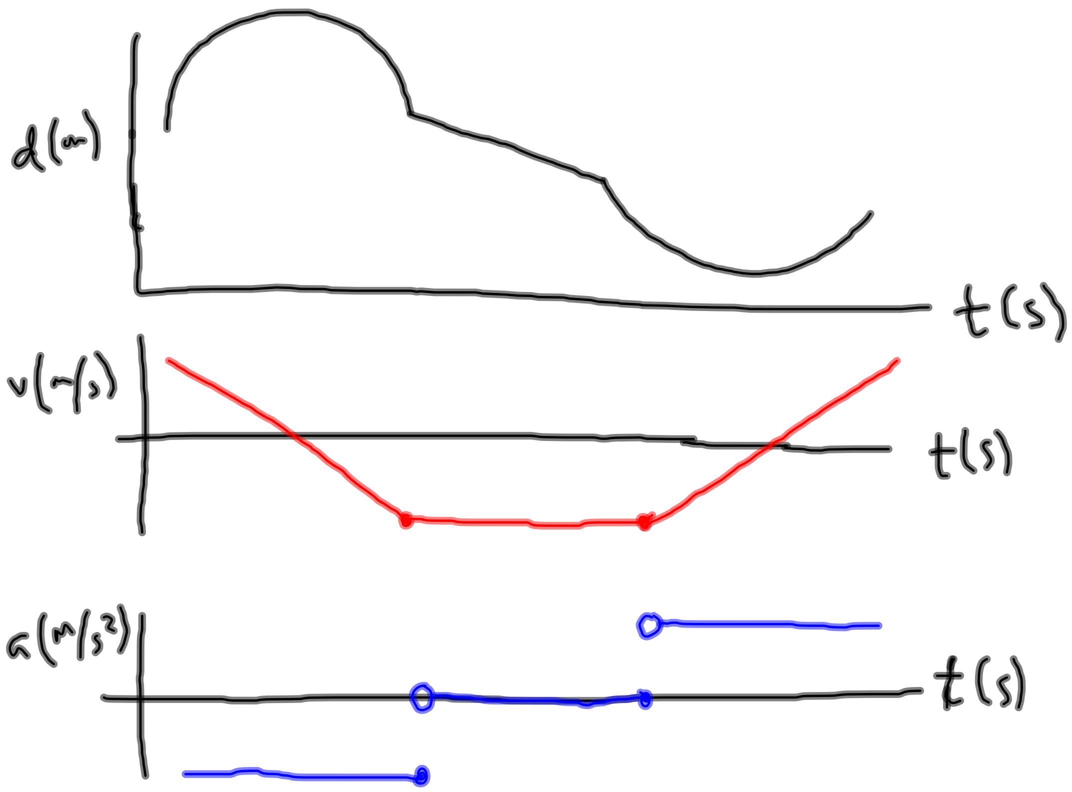
Graphing:




d(m)
t(s)
v(m/s)
t(s)
a(m/s²)
t(s)


d(m)
t(s)
v(m/s)
t(s)
a(m/s²)
t(s)

Kinematics:

S: scalar
V: vector

	Variable:	Units:
S	t → time	s
S	d → distance	m
V	x → position (displacement)	m
V	Δx → change in displacement (position)	m
V	y → position	m
V	Δy → change in position	m
V	v → velocity	m/s
V	a_x → acceleration in x-direction	m/s²
V	$a_y = a_g$ → acc. in y-direction	m/s²

Equations:

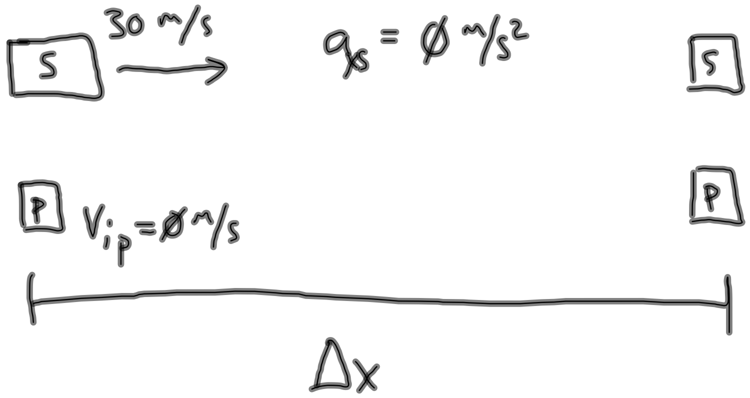
$$\Delta x = v_{ix} t + \frac{1}{2} a_x t^2$$

$$v_{fx} = v_{ix} + a_x t$$

$$v_{fx}^2 = v_{ix}^2 + 2 a_x \Delta x$$

Final Exam Review Notes 1st Block 1.3.12

A speeder passes a parked police car at 30.0 m/s. The police car starts from rest with a uniform acceleration of 2.44 m/s/s.
a) How much time passes before the speeder is overtaken by the police car?
b) How far does the speeder get before being overtaken by the police car?



a) $\Delta x = v_{is} t + \cancel{\tfrac{1}{2} a_{xs} t^2} \to \emptyset$ $a_{xs} = \emptyset \text{ m/s}^2$

$\Delta x = \cancel{V_{ip} t} \to \emptyset + \tfrac{1}{2} a_{xp} t^2$ $V_{ip} = \emptyset \text{ m/s}$

$V_{is} \cancel{t} = \tfrac{1}{2} a_{xp} t^{\cancel{2}}$

$$t = \frac{2 v_{is}}{a_{xp}}$$

$$= \frac{2 (30 \text{ m/s})}{2.4 \text{ m/s}^2}$$

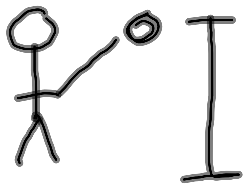
$$= 24.5 \text{ s}$$

b) $\Delta x_s = V_{is} t + \cancel{\tfrac{1}{2} a_{xs} t^2} \to \emptyset$

$$= (30 \text{ m/s})(24.5 \text{ s})$$

$$= 735 \text{ m}$$

Jason drops a volleyball from 2.0 m above the floor. How long will it take before the ball hits the ground?



$2\ m = \Delta y$

$V_{iy} = \emptyset\ m/s$

$t = ?$

$a_g = 9.8\ m/s^2$

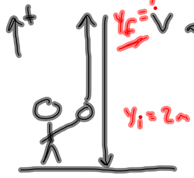
$$\Delta y = \cancel{v_{iy} t}^{\to \emptyset} + \frac{1}{2} a_g t^2$$

$$t = \sqrt{\frac{2 \Delta y}{a_g}}$$

$$= 0.64\ s$$

Jason then hits the volleyball so that it moves with an initial velocity of 6.0 m/s straight up.
- What is the maximum height that the ball reaches?
- How long does it take to reach the maximum height?
- How long does it take for the ball to reach the floor?

initial height is 2 m



y_f = v at top = $\varnothing$ m/s

$v_{iy} = 6$ m/s

$a_g = -9.8$ m/s²

$y_i = 2$ m

a) $\cancel{v_{fy}^2}^{\,\varnothing} = v_{iy}^2 + 2a_g\Delta y = v_{iy}^2 + 2a_g(y_f - y_i)$

$-v_{iy}^2 = 2a_g(y_f - y_i)$

$y_f - y_i = \dfrac{-v_{iy}^2}{2a_g}$

$y_f = y_i - \dfrac{v_{iy}^2}{2a_g}$

$= 2\,m + \dfrac{(6\,m/s)^2}{2(+9.8\,m/s^2)}$

$= 3.84\,m$

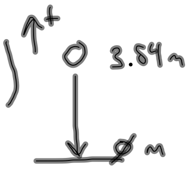
b) $\cancel{v_{fy}}^{\,\varnothing} = v_{iy} + a_g t$

$a_g t = -v_{iy}$

$t = \dfrac{-v_{iy}}{a_g}$

$= \dfrac{-(6\,m/s)}{(-9.8\,m/s^2)}$

$= 0.61\,s$

c) 

$v_{iy} = \varnothing$ m/s

$\Delta y = \cancel{v_{iy}t}^{\,\varnothing} + \frac{1}{2}a_g t^2$

$t = \sqrt{\dfrac{2\Delta y}{a_g}}$

$= \sqrt{\dfrac{2(-3.84\,m)}{(-9.8\,m/s^2)}}$

$= 0.89\,s$

total time $= t_{up} + t_{down}$

$= 0.61\,s + 0.89\,s$

$= 1.50\,s$

A tennis ball is thrown vertically upward with an initial velocity of 8.0 m/s.
a) What will the ball's speed be when it returns to its starting point?
b) How long will the ball take to reach its starting point?